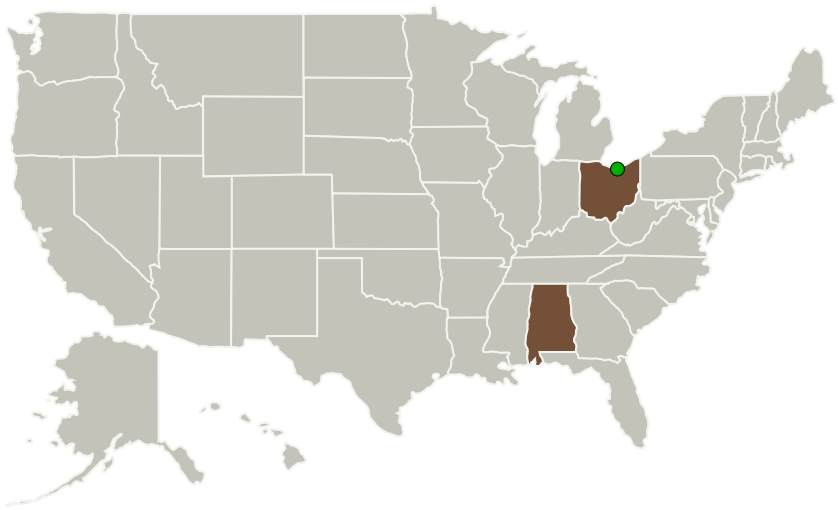
Propellant Gelation for Green In-Space Propulsion, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

Concerns in recent years about the toxicity and safe handling of the storable class of propellants have led to efforts in greener monopropellants and bi-propellants. CFDRC has worked with researchers in designing and synthesizing propellants called ionic liquids. These are generally not as high-performing as traditional storables and still have toxicity issues. Other work by CFDRC and Army researchers (among others) has demonstrated that gelling of liquid propellants, even toxic hypergols, can enhance their insensitive munitions (IM) properties to a significant degree. Besides the IM benefits, gelling of the fuel allows the suspension of ultrafine particles that both densify the propellant and add to the combustion energy, and thereby the specific impulse. CFDRC proposes to combine these research elements into a comprehensive assessment in Phase I to determine the degree to which the gelation of innovative propellant combinations can enhance the system benefits, including performance, safety, and launch costs. Then in Phase II, the desired propellants will be obtained or synthesized, and then gelled. A liquid apogee motor-class thruster will be fabricated and the gelled propellants will be hot-fired in the thruster for evaluation. The end Phase II will focus on identification of opportunities to transition and integrate this technology into NASA, DoD and commercial product lines, with special emphasis on NASA secondary payload propulsion applications.

Primary U.S. Work Locations and Key Partners



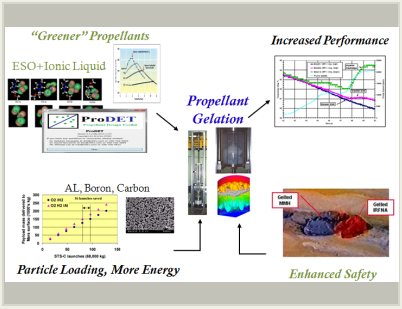


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
CFD Research Corporation	Lead Organization	Industry	Huntsville, Alabama
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Alabama	Ohio

Project Transitions

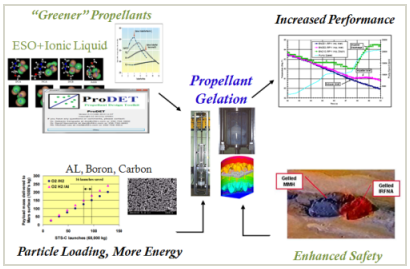
June 2016: Project Start

December 2016: Closed out

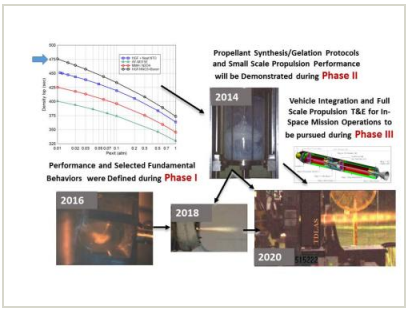
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139711)*

Images



Briefing Chart Image
Propellant Gelation for Green In-Space Propulsion, Phase I *(https://techport.nasa.gov/image/130194)*



Final Summary Chart Image
Propellant Gelation for Green In-Space Propulsion, Phase I Project Image *(https://techport.nasa.gov/image/133919)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
CFD Research Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

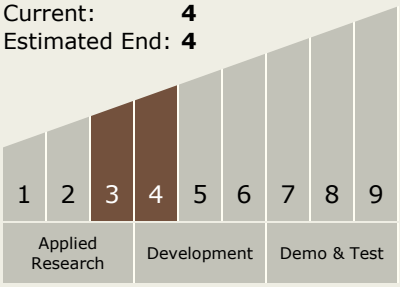
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Mark Ostrander

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Propellant Gelation for Green In-Space Propulsion, Phase I

Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.6 Gels

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System